



DRAFT STATEMENT
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NATIONAL INSTITUTES OF HEALTH
CONSENSUS DEVELOPMENT CONFERENCE STATEMENT
Diagnosis and Management of Dental Caries Throughout Life
March 26–28, 2001

NIH Consensus Statements are prepared by a nonadvocate, non-Federal panel of experts, based on (1) presentations by investigators working in areas relevant to the consensus questions during a 2-day public session; (2) questions and statements from conference attendees during open discussion periods that are part of the public session; and (3) closed deliberations by the panel during the remainder of the second day and morning of the third. This statement is an independent report of the panel and is not a policy statement of the NIH or the Federal Government.

Introduction

There has been remarkable progress in the reduction of dental caries (tooth decay) in the United States over the past 30 years. The existence of children with no dental caries, a rarity in the past, is no longer unusual. The use of fluoride in public water supplies, in toothpaste, and in professional dental products, improved oral hygiene, and increased access to dental care have played major roles in this dramatic improvement. Nevertheless, dental caries remains a significant problem. Nearly 20 percent of children between the ages of 2 and 4 have detectable caries, and by the age of 17 almost 80 percent of young people have had a cavity—a late manifestation of dental caries infection. In addition, more than two-thirds of adults age 35 to 44 years have lost at least one permanent tooth due to dental caries, and older adults suffer from the problem of root caries. Moreover, there remain large segments of the population in which the disease remains a major problem. These health disparities, detailed in the Surgeon General's Report on Oral Health, tend to be clustered in minority children, the economically underprivileged, older persons, the chronically ill, and institutionalized persons—the very populations with the lowest access to dental care.

1 It should be noted that dental caries is an infectious, communicable disease resulting in
2 destruction of tooth structure by acid-forming bacteria found in dental plaque, an intraoral
3 biofilm, in the presence of sugar. The infection results in loss of tooth minerals that begins on the
4 outer surface of the tooth and can progress through the dentin to the pulp, ultimately
5 compromising the vitality of the tooth. During the past few decades, changes have been observed
6 not only in the prevalence of dental caries, but also in the distribution and pattern of the disease
7 in the population. Specifically, it has been observed that the relative distribution of dental caries
8 on tooth surfaces has changed, and the rate of lesion progression through the teeth is relatively
9 slow for most people. These changes have important implications for diagnosis and management
10 of incipient lesions, predicting caries risk, and conducting effective disease prevention and
11 management programs for individuals and populations.

12 In order to make continued progress in eliminating this common disease, new strategies
13 will be required to provide enhanced access for those who suffer disproportionately from the
14 disease; to provide improved detection, risk assessment, and diagnosis; and to create improved
15 methods to arrest or reverse the noncavitated lesion while improving surgical management of the
16 cavitated lesion.

17 In an effort to optimize the identification of improved caries diagnostic, prevention, and
18 treatment strategies, and to assess the quality of the data on existing diagnostic and treatment
19 paradigms, the National Institutes of Health commissioned a Consensus Development
20 Conference (CDC) on Diagnosis and Management of Dental Caries Throughout Life. The CDC
21 explored these issues in a public forum on March 26–28, 2001, so that health care providers and
22 the general public can make informed decisions about this important public health issue.

During the first day-and-a-half of the conference, experts presented the latest dental caries research findings to an independent, non-Federal Consensus Development Panel. After weighing the scientific evidence the panel wrote a draft statement that was presented to the audience on the third day. The consensus statement addressed the following key questions:

1. What are the best methods for detecting early and advanced dental caries (validity and feasibility of traditional methods; validity and feasibility of emerging methods)?
2. What are the best indicators for an increased risk of dental caries?
3. What are the best methods available for the primary prevention of dental caries initiation throughout life?
4. What are the best treatments available for reversing or arresting the progression of early dental caries?
5. How should clinical decisions regarding prevention and/or treatment be affected by detection methods and risk assessment?
6. What are promising new research directions for the prevention, diagnosis, and treatment of dental caries?

This conference was sponsored by the National Institute of Dental and Craniofacial Research (NIDCR) and the NIH Office of Medical Applications of Research. The cosponsors included the National Institute on Aging and the U.S. Food and Drug Administration.

1. What are the best methods for detecting early and advanced dental caries (validity and feasibility of traditional methods; validity and feasibility of emerging methods)?

Observations and studies during the past two decades have indicated that diagnostic and treatment paradigms may differ significantly for large, cavitated lesions versus early, small lesions and demineralized areas on tooth surfaces. The essential anatomic-pathophysiologic

1 problem is that the carious lesion occurs within a small, highly mineralized structure following
2 penetration through the structure's surface in a manner which may be difficult to detect using
3 current methods. Additionally, carious lesions occur in a variety of anatomic locations, often
4 adjacent to existing restorations, and have unique aspects of configuration and rate of spread.
5 These differences make it unlikely that any one diagnostic modality will have adequate
6 sensitivity and specificity of detection for all sites. The application of multiple diagnostic tests to
7 the individual patient increases the overall efficacy of caries diagnosis. Existing diagnostic
8 modalities require stronger validation, and new modalities with appropriate sensitivities and
9 specificities for different caries sites, caries severities, and degrees of caries activity are needed.

10 A systematic review, based on predefined criteria, concluded that studies of reliability
11 and reproducibility of existing diagnostic modalities, which included visual-tactile, radiographic,
12 and electrical conductance examinations, were not strong. The most significant problems with
13 these studies were weak study designs; variability of examiner calibration; differences in criteria
14 for lesions; lack of standards for histological validation; lack of adequate numbers of studies on
15 several modalities and types of caries; and the sensitivity and specificity of caries detection.

16 Also, given the acceptance criteria of the systematic review, which excluded all studies without
17 histologic confirmation, the results regarding the validities of the examined modalities were
18 ambiguous.

19 A number of studies excluded by the systematic review were also addressed. The use of
20 sharp explorers in the detection of primary occlusal caries appears to add little diagnostic
21 information to other modalities and may be detrimental. Studies employing receiver operating
22 characteristic (ROC) analyses have shown radiology to have acceptable diagnostic efficacy in
23 detecting larger cavitated lesions in numerous in vitro and in vivo studies. There was agreement

1 that the literature is weak in the areas of diagnosis of caries on root surfaces and adjacent to
2 existing restorations. The problems of assessing the microbiological load of demineralized dentin
3 adjacent to or beneath existing restorations, and differentiating between residual and secondary
4 caries, are substantial and important. Digitally acquired and postprocessed images have great
5 potential in the detection of noncavitated caries and in the diagnosis of secondary caries.
6 Promising new diagnostic techniques are emerging, including fiber-optic transillumination and
7 light and laser fluorescence. These new modalities and developing digital imaging systems
8 require robust laboratory and clinical evaluation.

9 Existing diagnostic modalities appear to have satisfactory sensitivity and specificity in
10 diagnosing substantial, cavitated, dental caries; specifically radiographic methods are essential in
11 diagnosing interproximal carious lesions. However, these modalities do not appear to have
12 sufficient sensitivity or specificity to efficaciously diagnose noncavitating caries, root surface
13 caries, or secondary caries. There is currently no diagnostic modality which can differentiate
14 between microbiologically active caries and demineralized dentin without caries activity beneath
15 a restoration. This is a critical weakness in view of the significant percentage of restorations
16 inserted to replace existing restorations. The need for the identification and clinical staging of the
17 presence, activity, and severity of dental caries is of paramount importance in the deployment of
18 treatment strategies that employ increasingly important nonsurgical modalities, such as fluoride,
19 antimicrobials, sealants, and no treatment. Some diagnostic modalities are currently in various
20 stages of development and testing; these modalities will need to be evaluated, using rigorously
21 controlled clinical trials. Such studies will promote true staging of carious lesions, based on
22 highly sensitive and specific diagnoses, followed by appropriate, linked, treatment-planning
23 decision algorithms.

1 **2. What are the best indicators for an increased risk of dental caries?**

2 Recent decades have seen a remarkable decline in dental caries in the United States. The
3 level of caries incidence, however, is not evenly distributed in the population. Overall, 20 percent
4 of the population bears at least 60 percent of the caries burden while fewer than 5 percent of
5 adults are caries-free. Thus, effective dentistry requires early identification of children at high
6 risk for extensive caries so that they may receive early and intense preventive intervention, as
7 well as those at low risk so as to reduce unnecessary care and associated expenditures. Caries
8 incidence changes in adulthood and in geriatric populations, and risk and risk indicators may
9 differ due to changes in host and environmental characteristics. Accurate caries prognosis
10 throughout the life span, however, can support an appropriate, individualized level of care for
11 each patient and a more effective use of health care resources for the individual and for the
12 population. In addition, as dentistry moves towards earlier detection of lesions and a more
13 preventive rather than restorative orientation, good risk assessment will be essential for
14 improving the predictive values of new screening and diagnostic methods by preselecting at-risk
15 subpopulations.

16 Numerous risk indicators, that is, characteristics or measurements that assist in the
17 prediction of caries, whether or not they are involved in caries causation, have been suggested
18 for children. Unfortunately, more of the supportive data come from cross-sectional correlations
19 with accumulated caries experience than from prospective, protocol-based incidence studies. The
20 prospective studies employed different combinations of potential predictors in a variety of
21 populations, varied considerably in sample size and quality, and have not produced a broadly
22 applicable index or set of criteria for risk assessment. More and higher-quality comprehensive,
23 longitudinal, multifactor studies of implicated risk indicators are needed to obtain firm support

1 for their associations with caries incidence, to clarify the strengths of these associations in
2 differing populations, and to reveal the extent to which the risk indicators provide independent as
3 opposed to redundant information. In addition, although the nature of the disease process
4 suggests that many of the proposed indicators may well be appropriate throughout life, validation
5 studies in adult populations are largely absent or incomplete. Nevertheless, in practice there are
6 several readily determinable indicators that together provide helpful guidance when dealing with
7 otherwise healthy persons and some well-validated medical or disability conditions that place
8 individuals at heightened caries risk.

9 Thus far, the most consistent predictor of caries risk in children is past caries experience.
10 In addition, there is evidence of matrilineal transmission of mutans streptococci in early
11 childhood. Hence, the presence of caries in the mother and siblings increases risks for the child.

12 Regular brushing of tooth surfaces using a fluoride-containing dentifrice, reduces caries
13 risk. Conversely, inadequate exposure to fluoride confers increased risk. Conditions that
14 compromise the long-term maintenance of good oral hygiene are also positively associated with
15 caries risk. These include certain illnesses, physical and mental disabilities, and the presence of
16 existing restorations or oral appliances.

17 Fermentable carbohydrate consumption fuels acid formation and demineralization and is
18 associated with caries, particularly in the absence of fluoride. The amount, consistency, and
19 frequency of consumption determine the degree of exposure. Long-term regular doses of
20 medications containing glucose, fructose, or sucrose may also contribute to caries risk.

21 Medical conditions such as Sjögren's syndrome, pharmacological agents with xerostomic
22 side effects, and therapeutic radiation to the head and neck, lower salivary flow rate to
23 pathological levels and dramatically elevate a patient's risk of caries. This suggests that normal

1 salivary flow rate is protective against caries. Some studies indicate that low buffering capacity,
2 low salivary IgA, and low salivary calcium and phosphate are weakly linked to increased caries
3 as well.

4 Mutans streptococci is an established etiologic agent for caries, and its presence clearly
5 indicates the potential for cariogenic activity. However, its presence alone is no more than
6 weakly predictive of clinical caries activity.

7 While some of the risk indicators known for children may well be applicable across all
8 ages, some may differ across ages in the way they act or in their degrees of importance, while
9 other risk indicators must be considered distinctive for adult and elderly populations. Thus, the
10 inability to maintain good oral hygiene and xerostomia are risk factors of special significance
11 among the elderly, and gingival recession uniquely increases the risk of root caries in elderly
12 populations by exposing previously protected root surfaces to cariogenesis.

13 Low indices of socioeconomic status (SES) have been associated with elevations in
14 caries, although the extent to which this indicator may simply reflect previous correlates is
15 unknown. Low SES is also associated with reduced access to care, reduced oral health
16 aspirations, low self-efficacy, and health behaviors that may enhance caries risk.

17 Caries is an etiologically complex disease process. It is likely that numerous microbial,
18 genetic, immunological, behavioral, and environmental contributors to risk are at play in
19 determining the occurrence and severity of clinical disease. Assessment tools based on a single
20 risk indicator are therefore unlikely to accurately discriminate between those at high and low
21 risk. Multiple indicators, combined on an appropriate scale and accounting for possible
22 interactions, will certainly be required.

1 **3. What are the best methods available for the primary prevention of dental caries initiation**
2 **throughout life?**

3 In the last 30 years a number of community- and individual-level strategies for
4 preventing caries, notably water fluoridation and the use of fluoridated toothpastes, have been
5 highly successful. This Consensus Conference did not evaluate the evidence for effectiveness of
6 water fluoridation. This question has been the subject of public debate. It is widely accepted as
7 both effective and of great importance in the primary prevention of dental caries. In light of this
8 remarkable accomplishment, this portion of the report focuses on interventions that may provide
9 additional benefit in the primary prevention of dental caries in individual patients.

10 Some of the evidence on which this report is based addressed the effectiveness of
11 interventions when used in populations not specifically selected on the basis of having high risk
12 for dental caries. Almost all of the relevant studies involved populations of children between
13 6 and 15 years of age. The interventions included application of acidulated phosphate fluoride
14 gel (APF), fluoride varnish, chlorhexidine gels, pit and fissure sealants, and the use of dentrifices
15 and other products containing noncariogenic sweeteners.

16 **Acidulated phosphate fluoride gel (APF):** Evidence for the efficacy of APF gel applied
17 1–2 times per year was consistently positive.

18 **Fluoride varnish:** The evidence for the benefit of applying fluoride varnish to permanent
19 teeth is generally positive. In contrast, the evidence for effectiveness of fluoride varnish applied
20 to primary teeth is incomplete and inconsistent.

21 **Chlorhexidine gels:** The evidence for the use of chlorhexidine gel is moderately strong,
22 although many of the studies demonstrating its effectiveness used concomitant preventive
23 measures.

Pit and fissure sealants: Pit and fissure sealants have been demonstrated to be effective in the primary prevention of caries, and their effectiveness remains strong as long as the sealants are maintained.

Products containing noncariogenic sweeteners: Noncariogenic sweeteners have been delivered to teeth as constituents of chewing gum, hard candy, and dentifrices. The evidence for both sorbitol and xylitol is positive, although the evidence for xylitol is stronger. Almost all studies of these agents included other interventions, such as fluoridated dentifrices, dietary modification, and oral hygiene instruction.

Combination interventions: There is reason to believe that preventive strategies may be more effective when they are combined than when they are administered individually. Numerous combination interventions have been studied. These include combined fluoride interventions, chlorhexidine plus fluoride, chlorhexidine plus sealants, and chlorhexidine plus xylitol. All studies included instructions in dietary modification and oral hygiene and instructions for control and experimental groups. In general, these combination treatments have been shown to be effective in preventing caries in children.

Consistent positive evidence was found for the effectiveness of all reviewed preventive interventions in unselected populations of children. Furthermore, the effectiveness of these interventions appears to increase as baseline DMSF (decayed, missing, and filled surfaces) scores increase, suggesting that they may be particularly effective in high-risk populations while raising questions about their cost-effectiveness in low-risk populations.

When review of the evidence is confined to studies aimed at high-risk individuals, there is a relatively small number of methodologically strong, sufficiently large studies specifically addressing the effectiveness of primary prevention interventions, with the exception of fluoride

1 varnish, for which there is fair evidence of effectiveness. For these reasons, the panel concluded
2 that carefully designed studies with adequate power and sufficiently long follow-up may be
3 necessary to select the best intervention or combination of interventions that should be applied to
4 selected groups.

5 The panel makes no comment on primary prevention of secondary caries, or on primary
6 prevention of either occlusal or interproximal caries in adults, as no evidence was available to
7 address these questions. Evidence regarding primary prevention of root caries is also very
8 limited. Additional studies will be required to define optimal preventive intervention strategies
9 for these conditions.

10 **4. What are the best treatments available for reversing or arresting the progression of early**
11 **dental caries?**

12 The caries process is endemic and potentially both preventable and curable. The latter can
13 be achieved by identifying and arresting or reversing the disease at an early stage. Although
14 more research is needed, clinical strategies to do this already exist. These strategies include
15 application of fluorides, chlorhexidine, sealants, antimicrobials, salivary enhancers, and patient
16 education. Fluorides and chlorhexidine can be delivered as varnishes, rinses, or gels. Many of
17 these same strategies are also appropriate for primary prevention.

18 A number of the above treatment methods have been tested in clinical populations.
19 However, the quantity and quality of the data vary by treatment.

- 20 1. **Fluoride.** The research data on fluorides in water and dentifrices support their
21 efficacy. The data also support the use of fluoride varnishes. For rinses and gel
22 applications the evidence is promising but not definitive.
23

2. **Chlorhexidine.** For varnishes and gels, the data are promising. Research data showing effectiveness of chlorhexidine rinses are lacking.
3. **Sealants.** The use of pit and fissure sealants is supported by the data.
4. **Combinations.** Combinations of chlorhexidine, fluoride, and/or sealants are suggestive of efficacy.
5. **Antimicrobials.** Although mutans streptococci is recognized as part of the pathology of caries and therefore an antimicrobial approach would seem reasonable, current data are inadequate to support antimicrobial treatments other than chlorhexidine and fluorides, both of which have antibacterial properties.
6. **Salivary Enhancers.** Although there are indications that pathologically low salivary flow, as a consequence of Sjögren's syndrome or as an effect of head/neck radiation treatment or xerostomic medications, is associated with caries, there is no evidence that low normal salivary flow produces a similar outcome.
7. **Behavioral Modification.** Most interventions require patient adherence, and current data provide some support for the efficacy of office-based behavioral interventions.

While there has been considerable progress in dealing with dental caries, it is still epidemic, particularly among vulnerable groups. The detection and treatment of early carious lesions by nonsurgical measures has considerable potential to further the reduction of this burden. Although more research on early dental caries is needed, data on primary prevention are sufficient to make some recommendations for dental practice. Practice would be further enhanced, however, by further research that addressed caries in the adult population, secondary caries, and root caries.

1 In the development of caries treatment, dentistry has moved historically from extraction
2 to surgical restoration. Identification of early caries lesions and treatment with non-surgical
3 methods, including remineralization, represent the next era in dental care.

4 This stopping and reversing of caries is dependent on early and accurate diagnosis, which
5 remains a developing field. If maximum benefits are to be obtained, improved diagnosis is
6 essential.

7 **5. How should clinical decisions regarding prevention and/or treatment be affected by detection**
8 **methods and risk assessment?**

9 At this time the panel senses a paradigm shift in the management of dental caries toward
10 improved diagnosis of early noncavitated lesions and treatment for prevention and arrest of such
11 lesions. Restorations repair the tooth structure, do not stop caries, and have a finite life span.
12 They are themselves susceptible to disease. With the defining of caries as a multifactorial,
13 multistage process extending from infection to demineralization and cavitation, clear diagnostic
14 and staging criteria as well as a clear understanding of risk and prognosis are needed to
15 determine dental treatment options. Evidence suggests that there are nonsurgical options for
16 prevention and arrest and reversal of early noncavitated lesions. The decision not to treat, or to
17 prevent, arrest, reverse, and/or surgically treat, are choices based upon these factors. Risk
18 indicators also are considered in estimating future disease. Thus, diagnostic techniques and the
19 influence of risk indicators need to be evaluated for all teeth surfaces and patients of all ages.

20 Although the evidence shows that many diagnostic methods are less than desirably
21 accurate, current diagnostic interpretations still must be used until new, more sensitive,
22 techniques are available and validated. The evidence-based reports supported previous caries
23 experience and pathologically low salivary flow rate as indicators of significant risk. Most

1 studies from the systematic reviews involved children and excluded root caries, adults, and
2 anterior teeth. Therefore, the clinician must extrapolate reportedly successful preventive and
3 arresting/remineralization techniques from children to adults, root caries, and anterior teeth. In
4 the absence of clear evidence on adequately sensitive diagnostic methods for detecting early
5 noncavitated lesions and risk assessment indicators, clinicians need guidelines for treatment.

6 Because research is still evolving in these areas, a series of guidelines created by
7 consensus groups using currently available information is needed for patient treatment. In the
8 absence of definitive evidence, choices must come from highly probable information. Selection
9 of interventions and evaluations of known risks need to be guided by quality studies and
10 literature.

11 Other reviews of literature and higher quality clinical studies are needed to contribute to
12 these guidelines. From guidelines, appropriate treatment(s) can be chosen. Examples of such
13 guidelines already exist.

14 Longitudinal studies with outcomes assessments are needed to determine the success of
15 specific treatments. Long-term retention and functioning of treated teeth without recurrence of
16 caries are essential outcome criteria. As evidence of better diagnostic methods, improved
17 treatments, and clearer definition of risk indicators is established, treatment guidelines can be
18 appropriately refined and individualized for the patient.

19 The dental profession has been successful in promoting caries prevention. Current
20 information indicates that the opportunity now exists to extend prevention and treatment of
21 caries to nonsurgical methods. These include further prevention, remineralization, and arrest of
22 early noncavitated lesions. Controlled longitudinal studies that inform third-party payers can do
23 much to support the adoption of more advanced diagnostic, preventive, and nonsurgical

1 techniques into the practice of dentistry. Studies that explore a range of reimbursement options
2 may be helpful in identifying reimbursement methods that both encourage and reward preventive
3 nonsurgical dental treatment. Practicing dentists must have adequate incentives to apply these
4 findings. Educational institutions and their curricula, state and national dental boards and board
5 examiners, and accreditation agencies must also support the growing evidence for prevention and
6 nonsurgical treatment where indicated.

7 **6. What are promising new research directions for the prevention, diagnosis, and treatment of**
8 **dental caries?**

9 In prefacing the listing of promising new research areas, it should be noted that the Panel
10 identified significant concerns about the nature of previous clinical research on dental caries. The
11 science of clinical research design has advanced rapidly in the past several decades. However,
12 the panel deemed that the design and execution of caries trials and epidemiological studies have
13 not kept pace with the current standard. Many previous clinical caries studies were neither well
14 designed nor well analyzed. They tended to be small, underpowered, improperly controlled, and
15 incompletely described. Thus, when subjected to modern systematic review techniques, the
16 overall quality of the database was judged usually to be in the range of poor to fair. Accordingly,
17 NIDCR should expand significantly its clinical and research program to match the recent
18 expansion in clinical training to promote improvement in the quality, size, and reporting of
19 clinical dental caries studies and the number of well-trained clinical investigators. In the future, it
20 will be imperative that markedly improved techniques be applied in each clinical study. In the
21 interim, it would behoove clinical caries researchers to consult widely with clinical research
22 methodologists and to ensure that their studies adhere to national and international criteria for

reporting of studies as used in systematic reviews. In this manner, the successful exploration of the clinical opportunities listed below will be facilitated.

Major Clinical Caries Research Directions

1. The **Epidemiology of Primary and Secondary Caries** needs to be systematically studied with population cohort studies that collect information on natural history, treatment, and outcomes across the age spectrum.
2. Research into **Diagnostic Methods**, including established and new devices and techniques, is needed. Development of standardized methods of calibrating examiners is needed.
3. **Clinical Trials** of established and new treatment methods are needed. These should conform to contemporary standards of design, implementation, analysis, and reporting. They should include trials of efficacy.
4. Systematic research on caries **Risk Assessment** is needed using population-based cohort techniques.
5. Studies of **Clinical Practice** including effectiveness, quality of care, outcomes, health-related quality of life, and appropriateness of care are needed.
6. **Genetic** studies are necessary to identify genes and genetic markers of diagnostic, prognostic, and therapeutic value.

Conclusions

This Consensus Development Conference, the first sponsored by the NIH on dental caries, provided an excellent venue to describe the great success that has been achieved in reducing caries prevalence. More importantly, it provided a public forum to review both the strengths and weaknesses of current dental caries research and clinical procedures. Effective

1 preventive practices, such as the use of fluoride, sugarless products, and dental sealants were
2 reconfirmed, and clinical studies to identify more conservative but more effective nonsurgical
3 and surgical approaches are to be applauded. However, it was evident that current diagnostic
4 practices are inadequate to achieve the next level of caries management in which noncavitated
5 lesions are identified early so that they can be managed by nonsurgical methods. Some new and
6 sensitive diagnostic approaches were presented to the panel, but concern was raised about the use
7 of histological confirmation of caries presence as an appropriate gold standard. The resolution of
8 these issues requires that surrogate markers, validated by histological confirmation, be
9 developed. Once these surrogate markers of dental caries activity are validated, rapid advances in
10 our understanding of the caries process are certain to follow.

11 In spite of optimism about the future, the panel was disappointed in the overall quality of
12 the clinical data set that it reviewed. Far too many studies used weak research designs or were
13 small or poorly described, and consequently had questionable validity. There was a clear
14 impression that clinical caries research is underfunded, if not undervalued. Moreover, incomplete
15 information on the natural history of dental caries, the inability to accurately identify early
16 lesions and/or lesions that are actively progressing, and the absence of objective diagnostic
17 methods are troubling. Several systematic reviews of the literature presented at the Consensus
18 Development Conference concluded that the majority of the studies were inadequate, and it is
19 clear that a major investment of research and training funds is required to seize the current
20 opportunities.

21 This is not to say that the diagnostic, preventive, and treatment techniques currently used
22 do not work, but rather that earlier studies to support their efficacy do not meet current scientific
23 standards. Indeed, given the dramatic improvements in reducing dental caries prevalence in the

1 past 30 years, both consumers and health professionals should not depart from the practices
2 which are likely to have contributed to this oral health improvement, including the use of a
3 variety of fluoride products, dietary modification, pit and fissure sealant, improved oral hygiene,
4 and regular professional care. In addition, pending new data, clinicians should apply both
5 preventive and therapeutic interventions in the manner in which they have been studied. When
6 solid confirmation of the effectiveness of promising new diagnostic techniques, nonsurgical
7 treatments of noncavitated lesions, and conservative surgical interventions for cavitated lesions
8 are obtained, dental health professionals and the public should embrace them rapidly in
9 anticipation of attaining still higher levels of oral health. None of these anticipated advances will
10 be achieved, however, in the absence of a progressive, third-party payment system that
11 acknowledges its responsibility to compensate providers adequately to ensure that the next
12 generation of conservative therapy can be enjoyed by the American people.

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